

**Diagnosis of Radiosonde Vertical Temperature Trend Profiles:  
Comparing the Influence of Data Homogenization vs. Model Forcings**

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## ABSTRACT

Measurements from radiosonde temperatures have been used in studies that seek to identify the human influence on climate. However, such measurements are known to be contaminated by artificial inhomogeneities introduced by changes in instruments and recording practices that have occurred over time. Some simple diagnostics are used to compare vertical profiles of temperature trends from the observed data with simulations from a GCM driven by several different sets of forcings. Unlike most earlier studies of this type, both raw (i.e., fully contaminated) as well as adjusted observations (i.e., treated to remove some of the contamination) are utilized. The comparisons demonstrate that the effect of observational data adjustment can be as important as the inclusion of some major climate forcings in the model simulations. The effects of major volcanic eruptions critically influence temperature trends, even over a time period nearly 4 decades in length.

In addition, it is seen that the adjusted data show consistently better agreement, than the unadjusted data, with simulations from a climate model for 1959-1997. Particularly noteworthy is the fact that the adjustments supply missing warming in the tropical upper troposphere that has been attributed to model error in a number of earlier studies

Finally, an evaluation of the fidelity of the model's temperature response to major volcanic eruptions is conducted. Although the major conclusions of this study are unaffected by shortcomings of the simulations, they highlight the fact that even using a fairly long period of record ( $\sim 40$  years), any such shortcomings can have an important impact on trends and trend comparisons.